

## CLAIMS

1. A medical grasping device comprising:

an elongate control member having an atraumatic distal tip section and a proximal end portion, said elongate control member further including a grasping portion proximal said distal tip section, said elongate control member being formed for low elongation;

an outer sheath with a passageway therethrough surrounding said elongate control member and relatively movable with respect thereto; and

a control assembly disposed at a proximal end of said outer sheath and said proximal end portion of said elongate control member and in operative relation thereto for urging said grasping portion from a distal end of said outer sheath and retraction thereinto.

2. The grasping device of claim 1, wherein said elongate control member is a flexible cannula defining a lumen extending therethrough into which a guide wire is receivable and movable with respect thereto.

3. The grasping device of claim 1 wherein the elongate control member is comprised of a low elongation material for low elongation distal to the proximal end portion and the proximal end portion is comprised of a high elongation material for tension absorption when the elongate control member is urged distally, the high elongation material being bonded to the low elongation material.

4. The grasping device of claim 1, wherein said outer sheath is flexible and kink-resistant and has lubricious outer and inner surfaces.

5. The grasping device of claim 1, wherein said atraumatic distal tip section tapers to a blunt and rounded tip.

6. The grasping device of claim 1, wherein said control assembly includes an actuation section that is easily grippable for reciprocal movement along a handle to actuate said elongate control member with respect to said outer sheath to deploy and retract said grasping portion, respectively.

7. The grasping device of claim 6, wherein said actuation section includes a connecting block affixed to said elongate control member and is disposed within a longitudinal slot of said handle and is movable along said slot between opposite ends thereof.

8. The grasping device of claim 1, wherein said grasping portion comprises a plurality of preformed wire loops.

9. The grasping device of claim 8, wherein said plurality of wire loops self-deploy transversely upon emerging from said distal end of said outer sheath.

10. The grasping device of claim 8, wherein each of said wire loops is substantially circular upon full deployment.

11. The grasping device of claim 10, wherein each of said wire loops includes side sections that overlap with side sections of adjacent ones of said wire loops.

12. The grasping device of claim 8, wherein each of said wire loops is pie-shaped and includes arcuate outer sections having a radius about equal to a radius of a deployment site of a vessel into which the grasping device is inserted.

13. The grasping device of claim 1, wherein said grasping portion comprises four preformed wire loops that self-deploy transversely upon emerging from said distal end of said outer sheath approximately equally spaced angularly about a longitudinal axis of said elongate control member and thereby generally occupy a full cross-section of a vessel into which the grasping device is inserted.

14. The grasping device of claim 1, wherein said grasping portion comprises a plurality of wire loops that each are formed from a superelastic alloy.

15. The grasping device of claim 1, wherein said grasping portion comprises a plurality of wire loops having proximal end portions that are joined to said elongate control member at affixation joints and initially extend axially from said elongate control member even when said wire loops emerge from said distal end of said outer sheath and self-deploy transversely of a longitudinal axis of the grasping device.

16. The grasping device of claim 15, wherein each of said wire loops includes an arcuate outer section that upon deployment extends toward a wall of a vessel into which the grasping device is inserted.

17. The grasping device of claim 16, wherein each of said wire loops includes arcuate side sections that extend toward an axial center of said grasping portion and then curve gradually toward said distal end of said elongate control member to proximal ends that are affixed by said affixation joints thereto and are in axial alignment therewith adjacent to said affixation joints.

18. The grasping device of claim 17, wherein said wire loops comprise nitinol wire segments.

19. The grasping device of claim 18, wherein each of said wire loops including said proximal ends are within a cold-worked bend of a respective one of said nitinol wire segments.

20. The grasping device of claim 1, wherein:

said elongate control member is a flexible cannula defining a lumen extending therethrough into which a guide wire is receivable and movable with respect thereto;

said outer sheath is flexible and kink-resistant and has lubricious outer and inner surfaces;

said control assembly includes an easily grippable actuation section along a handle to actuate said elongate control member with respect to said outer sheath; and

said grasping portion comprises a plurality of preformed wire loops of nitinol that upon deployment extend generally forwardly and radially outwardly to substantially traverse the cross-sectional area of the vessel wall into which the grasping device is inserted, each of said wire loops including an arcuate outer section of complementary shape to a vessel wall portion upon deployment, and including side sections that extend toward an axial center of said grasping portion and then curve gradually toward said distal end of said elongate control member to proximal end sections that are affixed by affixation joints to said elongate control member and are in axial alignment therewith adjacent to said affixation joints.<sup>1</sup>

21. A medical grasping device comprising:

an elongate control member having an atraumatic distal tip section and a proximal end portion, the elongate control member further including a grasping portion proximal the distal tip section, the elongate control member being comprised of a low elongation material for low elongation distal to the proximal end portion, the proximal end portion being comprised of a high elongation material for tension absorption when the elongate control member is urged distally;

an outer sheath with a passageway therethrough surrounding the elongate control member and relatively movable with respect thereto; and

a control assembly disposed at a proximal end of the outer sheath and the proximal end portion of the elongate control member and in operative relation

thereto for urging the grasping portion from a distal end of the outer sheath and retraction thereinto.